

**REQUEST FOR RECONSIDERATION**  
**U.S. Application No.: 09/739,387**

In the present invention, the content of Co is less than 7%. This feature is desired from the viewpoint of economy because Co is an expensive element. Since Co is an element effective to enhance the strength of the maraging steel, such a high content of Co of 10% disclosed in Pinnow would bring about a further enhanced strength. However, the material containing this high content of Co is a conventional material as disclosed in Pinnow and is an expensive material due to the high content of Co.

To solve the above problems, the present invention makes it possible to reduce the content of Co while obtaining excellent strength of the maraging steel by substituting other strengthening elements for Co. These strengthening elements are Si, Mn and Al.

Regarding these elements, the amount of Si or Mn may be zero as pointed out by the Examiner, because Al is the most effective as the strengthening element. Accordingly, the content of Al was amended to be not less than 0.06 % but not more than 2.0% in the Amendment filed on January 4, 2002.

The claims of the Pinnow recite "up to 2.5% Al"; however, neither function nor intention for adding aluminum is disclosed by Pinnow. In addition, none of the specific alloys disclosed in Table 1 of Pinnow contains aluminum.

In comparing the hardness of the specific alloy disclosed in Pinnow with that of the present invention while showing the heat treatment conditions for comparison, there is a remarkable difference shown below.

The present invention:  
Solution treatment  
825 to 960°C

Aging treatment  
490°C

Hardness  
502 to 632 Hv

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|                   |                 |                 |
|-------------------|-----------------|-----------------|
| Pinnow:           |                 |                 |
| Solution annealed | Aging treatment | Hardness        |
| 1550°F (845°C)    | 900°F (482°C)   | 48 to 50.5 HRC  |
|                   |                 | (484 to 520 Hv) |

The specific alloys of Pinnow contains about 10% Co. On the other hand, the content of Co is less than 7% in the maraging steel of the present invention; however, the level of the attained hardness is equivalent to or more than that of the alloy of Pinnow. Such hardness is brought about from the feature of the present invention, that Al is positively added together with optional Si and Mn while reducing the amount of Co, so that the strength of the maraging steel may be enhanced.

In Examples Nos. 17 to 19 of the present specification, neither Si nor Mn is added and the strength of the alloys is brought about by Al. In these Examples, the hardness obtained after the aging treatment in the range of 502 to 568 Hv, which makes it apparent that the addition of Al alone remarkably enhances the hardness of the maraging steel of the present invention. Incidentally, the higher the hardness, the higher the strength of the maraging steel becomes. Namely, the higher hardness means enhancement of the strength of the maraging steel.

In other words, even in a case where the amount of Co, as well as Ti, is reduced to a low level, it was never thought or expected by those of ordinary skill in the art that a high level of hardness can be obtained by positively adding an appropriate amount of Al, which is one of the most remarkable distinctions between the present invention and Pinnow and which is the reason why it is possible to reduce the content of expensive Co to the level of less than 7% in the present invention.

Thus, in view of this remarkable advantage brought about from the positive addition of Al in the maraging steel containing a low amount of Co, the present

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invention is distinguished from Pinnow.

Accordingly, Applicants respectfully submit that Pinnow fails to teach or suggest the present invention. Therefore, withdrawal of the foregoing rejection is respectfully requested.

**II. Response to rejection of claims 7, 8-10, 17 and 18-20 under 35 U.S.C. § 103(a)**

On page 3 of the Office Action, the Examiner maintains the rejection of claims 7 and 17 under 35 U.S.C. § 103(a) as being unpatentable over Pinnow in view of Whitaker. On page 4 of the Office Action, the Examiner maintains the rejection of claims 8-10 and 18-20 under 35 U.S.C. § 103(a) as being unpatentable over Pinnow further in view of JP 62-080225 or JP 63-026345.

In response, Applicants respectfully traverse the above rejections for the reason that claims 7-10 and 17-20 should be allowed by virtue of their dependence from claims 1 and 11, respectively, which are not taught or suggest by Pinnow for the reasons discussed above.

In addition, Whitaker discloses an alloy of a maraging steel class that is used at a low temperature, which alloy is distinct from the alloy of the present invention in the respect of the Mo content of 2%. Namely, in the present invention, it is indispensable for Mo to be added in the range of 3.0 to 7.0%. In a case where the content of Mo is less than 3.0%, the tensile strength of the maraging steel is lowered as disclosed in the present specification. More specifically, as shown from Comparative Example No. 21, which contains Mo in the amount disclosed in Whitaker of 2%, the hardness thereof becomes such a low level as to be 381 Hv, even where the content of Co is raised up to 8.5 %.

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The Examiner has alleged that the difference of the Mo content between the present invention and Whitaker is not so large; however, the difference of Mo content causes a great difference in hardness as to be not less than 100 Hv. The reasons for this difference in hardness seems to reside in the low content of Co in Whitaker together with the low content of Mo and the lack of addition of an element for enhancing the strength in place of the reduced amount of Co. Further, it is not thought of or expected from the disclosure of Whitaker that the strength can be enhanced by positively adding Al, even in a case where the content of Co is at a low level.

Since it is apparent from the alloys of Pinnow that the reducing of the amounts of Mo and Co as in the case of Whitaker makes it impossible to obtain high strength, it is impossible to obtain a maraging steel of high strength even if these two cited references were combined.

Further, each of the cited JP 62-080225 and JP 63-26345 merely discloses the technique of applying a nitriding treatment to the maraging steel. However, no chemical composition regarding the maraging steel is disclosed therein. Namely, in JP 62-080225 and JP 63-26345, there is no disclosure regarding a maraging steel having a low amount of Co or the positive addition of Al.

Thus, even if Pinnow were combined with JP 62-080225 and JP 63-26345 as asserted out by the Examiner, no positive addition of Al is taught or suggested. Thus, the present invention is distinguished from the combination of Pinnow, JP 62-080225 and JP 63-26345.

In view of the above, Applicants respectfully submit that cited references fail to

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teach or suggest the present invention. Accordingly, withdrawal of the above rejections is respectfully requested.

**III. Conclusion**

Reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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